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Science and Technology for Tomorrow's Aerospace Forces

Success Story

ADVANCED COMPOSITES DESIGN TRAINING AIDS ASPIRING OLYMPIC ATHLETES

An Advanced Composites Office (ACO) project enabled one of its newest members to acquire and hone additional computer-aided design (CAD) skills, while transferring Air Force composite processing technology to a non-military application.

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Accomplishment

Engineers at the Materials and Manufacturing Directorate redesigned the aerodynamic component of an Olympic racing skeleton sled using advanced aerospace composites. This unique composites design training effort may carry an Air Force officer to victory in the 2002 Winter Olympics.

The redesign effort, developed to provide valuable hands-on CAD, three-dimensional (3-D) modeling experience for a new member of the ACO, also proves and advances several composite material concepts that has application to aerospace vehicles.

Background

The skeleton sled is comprised of a steel chassis and steel runners. The athlete lies face down on top of the sled in a head-first position. The bottom of the sled, or pod, is comprised of a steel (sometimes fiberglass) sheet affixed to the underside of the chassis to provide aerodynamic benefits, much like the underside of a Formula One racing car.

ACO engineers used a hand-built model of the pod to generate a 3-D representation, placed the pod into the CAD program, and changed the part's shape. To optimize the contour for airflow, ACO engineers made two different part designs, each conforming to the standard two-feet wide by three-feet long dimensions.

Next, the engineers downloaded the 3-D model to a five-axis router and cut a wooden master. Then, they used the master to make a fiberglass female mold. With this mold, engineers produced a hand lay-up part using the same graphite epoxy employed on the C-17 transport aircraft.

Since strength is a critical factor in skeleton sleds, the engineers used an autoclave to optimize curing of the sled pod. The skeleton sled has no steering, braking, or propulsion capability. It moves only by the pushing force provided by the athlete at the beginning of the race and the force of gravity as it winds through the course, sometimes at speeds in excess of 80 mph.

Materials and Manufacturing
Technology Transfer

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-ML-19)